Issued January 29, 1908.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY.—CIRCULAR 120.

A. D. MELVIN, CHIEF OF BUREAU.

SOME OBSERVATIONS ON RABIES.[a]

By E. C. SCHROEDER, M. D. V.,

Superintendent of Experiment Station.

THE REALITY OF THE DISEASE.

The disease commonly known by the names of rabies, hydrophobia, lyssa, canine madness, etc., is strictly one of the easily preventable diseases. Its communication from subject to subject depends upon actual inoculation, and its persistence among dogs and its frequent transmission to other animals and to persons are conditions directly traceable to the absence of regulations of a kind commonly enforced for the suppression of other infectious diseases. The failure to adopt reasonable measures probably rests largely on a misconception of the frequency with which rabies occurs and to a great extent on a false sentiment against subjecting dogs to proper restraint.

While there is no desire to enter into the still active controversy regarding the existence or nonexistence of the infectious disease that has been repeatedly described under the name of rabies or one of its synonyms, this side of the subject can not be ignored.

It is something of a mystery why a greater diversity of opinions should be held about rabies than about other infectious diseases. Its occurrence, nature, symptoms, mode of communication, etc., are facts of observation and investigation that have an evidential value fully as strong as the best reasons that can be given for our belief in the existence of diseases like smallpox, scarlet fever, measles, etc.

Many lovers of the dog, who regard him as man's best friend among animals, seem to believe that it is an unjust charge against his admirable character to acknowledge that he may suffer with rabies. Their view is unreasonable, as the susceptibility of an animal to disease has no connection with its moral nature or character, and we can not obliterate or modify facts by refusing to accept them; but, if a dangerous condition exists, we may greatly increase the amount of suffering it causes by denying and ignoring it and permitting it to operate without restraint. To admit the truth about rabies may mean that we accept a fact the existence of which is antipodal

[a] Reprinted from the Twenty-third Annual Report of the Bureau of Animal Industry (1906).

24784—Cir. 120—08

to our wishes and contrary to our sense of justice, but it is no more a criticism against the commendable attributes of the dog, through which he holds our affections, than it is an adverse criticism of man to assert that he may become affected with any one or more of a number of diseases through which he, as an individual, quite independent of his moral personality, becomes a menace to the welfare of his immediate associates and indirectly to the entire community. The dog has virtues enough to hold his place in our esteem in spite of the fact that he may be the victim of rabies and do great harm while he is affected with this horrible disease, which deprives its subjects of all moral responsibility before the desperate agony it causes ends in death.

THE EXISTENCE OF RABIES ESTABLISHED BY IMPARTIAL INVESTIGATION.

A deliberate denial of the existence of rabies means one of two things—either a lack of information or an impeachment of the honesty of innumerable impartial observers and investigators. Those whose denial is based on lack of information, if they are at all open to conviction, will change their minds after examining what has been written on the subject by men who are above the reproach of an attempt to malign the canine species. To those who have never seen rabies and for that reason can not be convinced of its existence it can only be said that not to be acquainted with a thing through personal experience, not to have seen or encountered it, not to have knowledge of it through our senses, means nothing but inexperience relative to the thing in question. The writer has never seen a case of smallpox or Asiatic cholera, and yet they are, unfortunately, common diseases. He has not seen the Asiatic continent, but that does not reduce its great area by the smallest fraction of an inch or its enormous population by one person.

A general impeachment of the honesty of the many writers who have recorded their observations of rabies approaches a libel on human nature such as it is sincerely hoped no facts will ever give the semblance of truth. The moral side of man has its defects, but it is not corrupted by a widespread degradation that can lead thousands of otherwise honorable, truthful men, among whom must be included many famous, clear-visioned benefactors of mankind, to deliberately falsify truth for no better purpose than a supposed pleasure that is to be derived from falsification or, at best, an attempt to malign a species of animals. The animosity that some persons may feel toward the canine tribe may be sufficient to account for a too ready acceptance of what they believe is derogatory to it, but among the writers on rabies who have information at first hand are many lovers of dogs, who are willing and ready to defend the dog with

sturdy energy against all enemies, and who believe that the worst enemy against which he must be defended is the desperate agony of the fatal, infectious disease now under consideration.

FALLACY OF THE IMAGINATION THEORY.

There are persons who admit the existence of an affection that frequently follows injuries inflicted by the teeth of a dog, but they say that it has nothing to do with an infectious agent. The disease is alleged to be caused by an overwrought imagination that dwells with extreme, morbid intensity on a greatly feared but wholly fictitious danger. To those who hold this belief it must be apparent, even if it is admitted that an adult person may be found occasionally with a sufficiently active imagination to give it the least validity, that children and the lower animals never possess the necessary power of abstract concentration to induce through its exercise or the exercise of any faculty of the mind an acute, rapidly fatal, nervous affection. Hence this belief, which suggests an abstract process that leads to a concrete, unintentional suicide or self-destruction, does not explain the occurrence of rabies among children and animals, and especially not among the latter.

If there is one place where a sharp line can be drawn between man and the whole known world of organisms subordinate to him, it is in connection with this matter of abstract thought. Man alone has the intellectual endowment for abstract thought. Animals, and children during the first years of their lives, if they think at all, confine their thoughts to the contemplation of concrete objects and their concrete attributes. Imaginary dangers, fictitious evils, and abstract apprehensions will not reduce the health or endanger the life of a horse, a cow, a sheep, a dog, or of a child until it has learned to express its thoughts in language.

One of the tests of the validity of a theory is to determine its compatibility with all the known facts for which it is devised to offer an explanation. The imagination or apprehension theory, as it may be called, to supply an explanation for the peculiar, fatal, nervous disease that is meant when the name rabies is used, is insufficient to account for the disease in anything but some human beings who have passed the years of early childhood. This alone is a fatal objection to it, to say nothing of the fact that it is altogether too complex to serve as a reasonable explanation for any manifestation of nature. Nature, wherever we know her, is simple and direct. The multiplication of a living virus in the body of an animal, the communication of this virus directly or indirectly by the affected animal to another animal, the multiplication of the virus in and the consequent affection of the second animal, are processes that

have been demonstrated to occur with most infectious diseases in man and animals, and this is the simplest conceivable explanation of what infection is and how contagion is effected.

Here, of course, the question will be asked, " When did the first case of rabies originate, if it is the result of a living virus that grows in the body of a person or animal and every case supposes the previous existence of an earlier case? " The answer to this question is a mystery that is buried in the primary causes of things. The same question may be asked with equal right about every living organism in the universe. Each cornstalk requires the existence of a previous cornstalk that produced fertile seed, and each weed an earlier weed of a similar kind; and this is true of every animal and plant in the whole category of living things, from the highest mammal to the lowest microzoon, from the largest tree to the most minute bacterium. To deny the existence of rabies because we can not trace the virus to its primary origin is to use an argument that can be applied with equal justice to show the nonexistence of both the dog and his master and everything else living and dead. Primary, fundamental, or final causes are beyond human comprehension, and those persons who require them as a basis for their beliefs, if they are consistent, must necessarily deny the existence of everything.

THE FREQUENCY AND DISTRIBUTION OF RABIES.

Relative to the frequency with which rabies occurs and the broad territory over which it is disseminated, many carefully compiled statistics from medical journals could be quoted, but it is not necessary for our purpose to do so, as the daily newspapers supply abundant material. The Chicago Chronicle of September 22, 1906, states that rabies prevailed during the year in the following States: Massachusetts, Ohio, the Dakotas, New York, Michigan, Connecticut, Indiana, New Jersey, Kentucky, Pennsylvania, Delaware, Illinois, and Rhode Island. To this may be added cases that came to the writer's personal notice from Maryland, Virginia, the District of Columbia, and North Carolina.

During three weeks of the month of January, 1907—a season of the year when rabies is supposed by many to be least prevalent—there appeared in the daily papers of Washington, D. C., no less than twelve items dealing with cases of rabies or hydrophobia in the eastern section of the United States. According to these reports at least nine persons had died recently as a result of the bites of rabid animals, and scores of people had been bitten.

At Norfolk, Va., a huge hound bit nine persons while it was suffering from rabies. Four of the persons—two policemen and two little children about 4 years old—were terribly bitten. Six of the victims were children ranging in age from 4 to 11 years. The body

of the dog was examined in the Pathological Laboratory of this Bureau, and the animal was pronounced to have been affected with genuine rabies.

One stops to think with horror of the apprehensive agony of the parents of these children, the suffering to which parents and children are subjected while treatment is being applied to prevent the development of the terrible disease, to say nothing of the expense of treatment, which for most people is an extreme hardship. Fortunately in this case the cost of the treatment for the persons who were bitten—$1,200—was raised by public subscription. The very idea of an injury to the tender, soft skin of a child can not be entertained by a normal mind without causing a shudder. It is to children first of all that our love and protection should be given, both against physical suffering and the greater agony that comes with the terror they endure when they are attacked by something against which they realize their impotence to defend themselves.

Of two deaths from rabies recently reported, one was that of a coachman who was infected by the caresses on his face of his pet dog that a few days later developed rabies, and the other of a child that showed no marks of having been bitten. Attention was called by the press to the danger of infection through any form of wound or abraded skin which becomes contaminated with rabic virus. The possibility of such infection through a wound is borne out by the fact that the inoculation of the virus into any portion of the body of experiment animals produces the disease. Injection of the fragments of the brain from a dog that has died of rabies under the skin or into the muscle of a rabbit produces typical, fatal rabies, often as rapidly as an injection into the brain. There is a marked relationship, however, between the rapidity with which the disease develops and the proximity of the point of inoculation to the brain. Wounds inflicted by rabid dogs about the head and neck are more rapidly fatal than those on the extremities, the legs or arms, or the lower portions of the body.

If it lies in the character of the dog to run amuck quite frequently or only occasionally, with no cause like rabies to explain his frenzy, we must regard him as having profited too little from his long domestication and association with man to enjoy special liberties and a freedom from restraint that no sane person claims for or wishes to bestow on horses, sheep, swine, or other species of animals. This running amuck, as it implies an inherent and incurable defect of character of an exceedingly objectionable kind, would constitute a more serious charge against the moral nature of the dog, if it were true, than rabies. Rabies is a disease that can be stamped out entirely by adopting and enforcing proper measures against it. An

inherent characteristic is a totally different matter, which would be as difficult to eliminate or eradicate as the tendency of dogs to bark.

TWO CASES IN HORSES AT THE EXPERIMENT STATION.

The case of a horse which died of rabies at the Bureau Experiment Station in the fall of 1906 presents a striking illustration of the terrible nature of the disease. On September 14, 1906, a small, bay mare, a tractable, intelligent animal, in good physical condition, somewhat advanced in age, was brought to the station by her owner to be kept in confinement and under observation because she had been bitten by a dog. The Pathological Division of the Bureau examined the dog and determined that it was affected with rabies. The mare was bitten on the right side of the face a few inches above the angle of the lips; the injury was clearly visible as a group of small scars. Shortly after the wound was received it was treated by a veterinary surgeon.

At the station the mare was placed in a large, well lighted and ventilated box stall, in which she was allowed to move about at will, untied. She remained well as far as could be determined from her appearance and conduct until September 27, when she failed to eat her evening meal, neighed a great deal, and seemed to be nervous and restless. On the following day, September 28, beginning at 8 a. m., she showed what may be regarded as the unmistakable symptoms of violent rabies. The symptoms observed and recorded are practically identical with those shown by a horse that became affected with rabies at the station in the year 1900 as the result of a bite inflicted by a rabid dog.

The preliminary symptoms were restlessness, nervousness, and loss of appetite. The mare was easily startled by sounds to which she was accustomed and did not ordinarily notice. These symptoms may be important in connection with horses that are known or suspected to have been bitten by rabid dogs and are retained in service or not properly confined to prevent them from harming persons and animals.

Beginning from twelve to twenty-four hours after the above symptoms, at 8 a. m. the mare was restless, her lips quivered, and there was some froth about her mouth. At 9 a. m. she was more restless, her face had an anxious expression, the froth about her mouth had increased, and she pawed the earth floor of the stall incessantly. At 10 a. m. practically no change was observed. At 11 a. m. in addition to the froth at her mouth a thick, viscid saliva fell in drops from her lips, her mouth was in constant motion, her tongue was protruded and drawn back repeatedly with a rapid movement, first to one side, then straight out, then to the other side, somewhat more frequently to the side on which her face had been bitten; her head

was swung violently up and down and from side to side; the muscles of her back were tense and those of her mouth, lips, chest, and shoulders twitched frequently. Although she was not observed to have made an attempt to bite during the two weeks she was at the station previous to the development of rabies and was said by her owner always to have been gentle and quiet, she now plunged viciously at every person who approached the stall, with her ears depressed and lips drawn back so far as to expose the full length of her front teeth and gums. She snapped frequently at the sides of the stall and seemingly at imaginary objects; her teeth came together with a sharp sound like the click of a steel trap. At 11.10 a. m. she passed urine. When her tail was accidentally touched she kicked viciously and repeatedly. These symptoms continued without noticeable change until 1 p. m., when she began to snap and paw more frequently and to bite her shoulders and legs. Her saliva was now thinner, less viscid, and flowed more freely, and was occasionally, when she moved her head violently, sprayed in a shower of drops to a distance of several feet. At 2 p. m. she struck with her front feet at the sides of the stall, threw herself, and regained her feet in a few minutes. At 2.30 p. m. she made frequent unsuccessful attempts to pass feces. At 3 p. m. lay down, tried to roll, got up, and passed a small ball of feces coated with thick, creamy mucus. At 3.15 p. m. passed urine of a strong, pungent odor; made frequent attempts to lie down, but remained on her feet. At 4 p. m. lay down and immediately began to bite her forelegs viciously; five minutes later was up again and some blood flowed from her mouth, due to self-inflicted injuries of her lips and tongue. Every muscle of her body twitched and quivered, and her respiration was greatly accelerated. At 4.15 p. m. seized her foreleg so violently with her teeth that she threw herself; viciously bit her now bleeding legs and shoulders over and over again; attempted to roll and thrashed her head against the floor of the stall; her eyes had a set, glassy appearance. At 4.30 p. m. she was still down, made no attempt to get up, but passed through all the motions with her legs and body, alternately, of very rapid trotting and violent running. She became comatose at 4.40 and died at 5.13 p. m.

The autopsy record is as follows: The meninges of the brain are greatly congested. The right shoulder shows numerous small tears and cuts in the skin; under these the tissues are contused and infiltrated with blood and serum. The right leg shows numerous abrasions. On the inner surface of the right forearm a hole an inch in diameter has been torn through the skin; under this the periosteum is partly stripped from the bone and the latter shows tooth marks and scratches. The tongue, lips, and face show numerous cuts and

bruises. The injuries were self-inflicted during paroxysms of agony and fury. The wound in the face, made by the rabid dog, was completely healed, but there was some congestion in the tissues where it was located. No other lesions of disease were found.

In one respect the symptoms in the mare differed from those of the horse referred to as having died in the year 1900. The latter perspired profusely and its entire body was as wet as though it had been dipped in water, while the body of the mare remained dry. In both cases the animals were harrowing objects. The combined and cumulative suffering of many dogs through continuous proper muzzling would be extremely mild in comparison.

The description is a weak attempt to represent the agony visibly suffered during eight long hours on the day the mare died. The conditions were unfortunately such that the poor animal could not be killed at once to end her agony, and to approach a horse while it is suffering with the violent paroxysms of rabies to apply alleviative treatment would be suicidal for the strongest man. Her violence made it impossible to obtain records of her temperature and pulse or to make other observations that require tactual examination. A pail of water in the manger of the stall was emptied several times. This could be and was refilled by pouring into it from the top of the stall partition. Whether the water was actually swallowed or only splashed out is uncertain, but she plunged her muzzle into it again and again, as though she was very thirsty and wanted to drink. There was no fear of the water. Her throat in the region of the larynx gave the impression of unusual prominence, but here again, because she could not be approached without great danger, no thorough examination could be made; but it is probable that the prominence was due to an extreme spasmodic contraction of the muscles of the larynx and pharynx.

The fury with which the poor beast plunged, bit, kicked, pawed, and thrashed about, and the terrible picture of suffering and violence she presented may be judged to some extent from the fact that men who are experienced in the care and management of large animals, and whose courage for handling unruly horses and cattle has been proved repeatedly in practice, actually approached her dead body with reluctance and uneasiness, and confessed that they would not have entered the stall before the mare died, under any consideration, however profitable.

The mare was bitten on September 3; was brought to the experiment station eleven days later, on September 14; showed the first symptoms of rabies on September 27, or thirteen days after her arrival at the station and twenty-four days after she was bitten, and died one day after the first symptoms were observed. The time that

elapsed between the bite of the dog and the death of the horse that contracted rabies in the year 1900 was somewhat longer. The horse was bitten on April 27 and died June 5, or after an interval of thirty-nine days.

For those who doubt the existence of rabies, or believe that it is a disease induced by the fear of an impending evil, the cases of these two horses offer food for reflection.

The number of horses kept at the experiment station at any one time during the last ten years varies from 10 to 40, and averages about 20. The total number of different horses that have been at the station during the last ten years, for periods of time varying from three months to ten years, is not less than 100. Among these only two are positively known to have been bitten by dogs that showed symptoms of rabies, and only these two horses contracted rabies. If there is no relation between the bites of the dogs and the affection of the horses, we have here a very remarkable coincidence. Lyssaphobia, or the dread of lyssa or rabies, as has already been pointed out, can not serve as an explanation with horses. There is and was nothing in the stalls or the stables occupied by the horses to account for their affection. Other horses occupied the same stables and the same stalls both before and after the two that died of rabies. The others had not been bitten by rabid dogs, and they remained perfectly well and nothing resembling rabies happened to them. Horses kept under precisely the same conditions as those that died of rabies for much longer periods of time also remained well. There is only one rational explanation, and it is this—that rabies is an infectious disease that is communicated from animal to animal or from animal to person by a bite or some other injury into which the virus of rabies is introduced.

INSTANCES OF DANGER FROM RABID DOGS.

The dog that bit the horse that died in the year 1900 afforded an example of the extent to which persons and animals over a large territory may be exposed to danger through a single rabid dog. He escaped from the yard of his owner in Washington, D. C., early in the forenoon and was killed by a blacksmith, whose dogs he viciously attacked, about 7 miles from the city, early in the afternoon. His weight was about 50 pounds. During the few hours he was at large he passed along a mile of city streets and through three surburban settlements, one of which is located fully a mile from the direct road between his point of escape and the place where he was killed. He is known to have attacked four persons, two horses, several cattle, and seven or eight dogs. The persons and cattle fortunately escaped injury; the one horse contracted rabies and the other was accidentally

killed by an electric car shortly after it was bitten, and the dogs were killed as a precautionary measure. If the persons attacked had been children and not resolute adults it is questionable whether they would have escaped. The dog passed directly by one public school and attacked two persons, a man and his sister, within a hundred yards of a second public school. At the time of his passage the children were within doors; had they been on their way to or from school, or out at recess, what might have happened is not pleasant to contemplate. He probably would have done more damage than the dog reported from Norfolk, Va., as having injured six children and three adults. Had the blacksmith who killed the dog failed to do so, it is difficult to say how much farther he would have gone or how much more damage he would have done.

Among my notes on rabies is the record of a large foxhound, a very valuable animal with a championship record for speed, that reads as follows: April 18, was not well in the morning, extremely restless and nervous, did not seem able to find a comfortable position; feverish, thirsty, got into a small stream of water several times as if to cool himself. At 4 p. m. the same day the dog disappeared and returned home at 6 a. m. April 20. After his return he was still restless and showed symptoms of paralysis about his lower jaw, his vision seemed to be affected, and he was unable to swallow milk or water, although he tried to do so. Succeeded in swallowing some solid food. The inability to swallow liquids while the ability to swallow solids remained is a very characteristic symptom of rabies.

The dog died on April 23. On post-mortem examination the body showed numerous comparatively fresh scars of the kind received by dogs when they fight with each other. The organs, as is usually the case with rabies, showed no sufficient lesions to account for the sickness and death. Four rabbits that were inoculated with a minute amount of an emulsion made by crushing a piece of the spinal marrow in sterile water died, one on May 8, two on May 10, and one on May 11, affected with typical paralytic rabies.

This dog, a large, speedy hound, was at liberty during thirty-six hours while he was affected with the active or furious form of rabies. The scars on his body showed that he had met and fought other dogs. All this occurred in a thinly settled county, but it shows how long a rabid dog may remain at large and roam before the paralysis that commonly precedes death from rabies makes him harmless. During the year following the death of the rabid foxhound quite a number of dogs contracted rabies in the territory over which he roamed.

It is truly marvelous that the amount of injury suffered by children through the vicious fury of rabid dogs is not greater; probably their safety is due to the instinctive fear they have for strange dogs and

their consequent tendency to seek a place of safety the moment a dog of unfriendly appearance attempts to approach them.

WHY DOGS ARE THE PRINCIPAL SOURCE OF THE CONTAGION.

The intimate association in our minds of dogs and rabies does not necessarily imply a greater susceptibility of dogs than other animals to the disease. The dog is not the only animal that can communicate rabies by a bite. The bite of a rabid horse, cat, or person is just as dangerous as that of a rabid dog; but it is only dogs and cats that are given an amount of liberty that makes them specially dangerous. No other animals, excepting possibly poultry and pigeons, are allowed to be at large in the same way unattended and unrestrained.

The dog is more dangerous than the cat because he is a social and the cat a solitary animal; that is, the canine family in its native state lives in packs and each individual craves association with other individuals of its kind, while the members of the feline family in their native state are solitary hunters and care nothing about society beyond the association of the sexes for purposes of procreation. The movements of cats are confined to hunting food and the search of the male for the female. The dog must have companions and is restless and unhappy without them. Social life of animals means many battles for the leadership of the pack or herd. The dog often fights instinctively for the glory of leadership and is naturally more pugnacious than the cat, which fights only in self-defense or to obtain some material benefit, either food or a mate or a preferred lair or shelter. Social animals as a rule range over a more extensive territory than solitary animals; it is absolutely necessary that they should do so in order to obtain a sufficient amount of food, as more food is required to feed a pack or herd than an individual or at most a pair. Everyone who has observed both dogs and cats knows of the greater tendency of the former to roam; it runs in their blood; it has been transmitted to them by their early ancestors. When dogs meet they greet each other; when cats meet, unless there is some material reason for a contrary action, they pass each other. Society means more opportunities for both concord and discord than solitude presents.

As rabies may be transmitted by a bite as early as six days before the symptoms of the disease manifest themselves, it is not difficult to see why the hereditary social desire, which brings with it frequent opportunities to fight, and the pugnacity required to gratify the instinct for leadership, should give the dog a position very different from that of the cat relative to rabies. If the cat was also a social animal, its superior agility, its ability to climb over obstructions and walk along narrow, elevated passages and ledges that are inaccessible to dogs, would long since have made it the more serious menace.

RAPID DIAGNOSIS BY MEANS OF SO-CALLED NEGRI BODIES.

Until the year 1903, when the investigator Negri discovered small bodies, which were named after him, in the protoplasm of the nerve cells of rabid animals, which occurred neither in health nor in the presence of other diseases, the post-mortem examination of persons and animals that succumbed to rabies gave only vague results. As with many other diseases of the nervous system, nothing truly characteristic could be found. It was necessary to base the diagnosis on the history, the symptoms, and the general conditions presented by each individual case, or to wait for the development of an inoculation test, in which a small animal, usually a rabbit, was used. Such inoculation tests sometimes required the passage of only ten or twelve days, usually as long as three weeks, and not rarely longer than a month.

Since the bodies of Negri were discovered it has become possible to make an absolute diagnosis of rabies within a few hours. These bodies have been found in 96 to 98 per cent of all cases of rabies that have been examined, and are so permanent that their presence can be demonstrated some time after decomposition of the tissues in which they are located has begun. Whether the bodies are the microparasites of rabies or a product of the disease has not been determined, but we have in them a positive factor that distinguishes rabies from all other known diseases, as well as from all normal conditions. The practical importance of this discovery, apart from its definite pathological significance, is well illustrated by the following occurrence:

A number of years ago a local physician informed me by telephone that he had under treatment an elderly woman because she had been severely bitten by her pet dog, which had suddenly and without apparent cause become so surly, morose, and irritable that it was necessary to kill it. I told the physician to send the dog's body to me so that I could obtain material from it to make a test inoculation for rabies. The body was sent, and I took out the brain and used small portions of it to inoculate two rabbits. The rabbits became affected with typical rabies and died on the seventeenth day after inoculation. When I called up the physician to inform him that the diagnosis of rabies was complete and to advise him to send his patient to a Pasteur institute for treatment as soon as possible, he told me in a very irascible manner that he did not need my information and that his patient was beyond Pasteur and all other treatment; that she had died of rabies four days earlier than my test rabbits, and that she had suffered agonies such as he hoped never to witness again.

The woman died on the thirteenth or fourteenth day after she was bitten; the bites were inflicted on her face, neck, and arms. Had the bodies of Negri been known then as they are known now, it could have been determined on the same day the dog was killed that he was affected with rabies, and his mistress would have resorted to Pasteur treatment without loss of time and would thus have escaped a terrible death.

A case like the foregoing is not unique or singular. The literature on rabies contains many that are parallel to it.

MEASURES FOR THE SUPPRESSION OF RABIES.

We now come to the important question, What action can be taken for the suppression of rabies?

Federal regulations have been advocated by many persons, but are not feasible. Rabies can be controlled only by close police surveillance, which, if the United States attempted to practice it, would engender bitter and unending controversies about State rights and would cost an enormous sum of money. The disease rarely assumes the form of an epidemic, and when it does so the most the Federal Government can do is to quarantine the State in which this occurs for the protection of the other States. Hence the adoption of regulations for the control of rabies must remain a matter for local action and be governed by locally prevailing conditions.

In all regulations the dog must receive first consideration, because he is, through a combination of his frequently pugnacious disposition, his social instinct, his tendency to range over a considerable area, and the great freedom given him to move about everywhere with little or no restraint, the main factor in the persistence and dissemination of rabies.

I have already made the statement that no one will claim for other domestic animals the same freedom from restraint that is commonly granted to the dog. If dogs were treated like horses, for example, both rabies and vagrant dogs would shortly cease to exist. The very freedom accorded to dogs seems to cheapen them in our estimation. In many instances the best reasons that owners can give for allowing their dogs to run at large unattended is that they have no value, and it is usually the least valuable dogs that do the most running.

MUZZLING.

When it is suggested that all dogs should wear muzzles, a great cry is raised against the cruelty of the practice; and yet no one claims that it is cruel to place a bit in a horse's mouth, harness on his body, to fasten him to a wagon or plow or something else to pull, and to allow him to go only where the driver directs without taking

into consideration the horse's inclination for direction or to go at all or to stop. It is no more difficult to accustom a dog to a muzzle than to break a horse to harness, and there is nothing cruel about either practice. Under domestication the horse is protected from numerous hardships to which he would be exposed in a wild state and is consequently more contented, and has more reasons for being so, with the relatively few exceptions of abuse to which the humane societies attend. The harness he wears is the price he pays for an assured shelter and a sufficient and continuous supply of nutritious food.

A dog will of course resent the presence of a muzzle until he becomes accustomed to it, precisely as the horse resents the presence of harness on his body and a bit in his mouth until he has learned to wear them as quietly as most horses do the world over. In some portions of Europe dogs are required to wear muzzles when they are not otherwise restrained from biting, and they do so as naturally and quietly as horses wear harness.

SUGGESTED LAWS.

If laws covering three points could be made and properly enforced, there is no doubt that rabies would soon have no existence but in the history of the past. The features to be embodied in such laws should be as follows:

1. The proper licensing of dogs and the extermination of those that are not licensed.

2. The proper muzzling of all dogs when they are in public places or on public highways.

3. To hold dog owners responsible for the damage traceable to their dogs.

Every dog should be required to wear a collar inscribed with the license number and the name and address of the owner. The cost of the license, collar, and muzzle would be a price by no means great to pay for the privilege of keeping a dog.

No one should oppose the capture and the speedy and painless destruction of homeless and ownerless dogs. These are the members of the canine family that do the most harm. They have wits that are sharpened by the struggle for existence to which they are constantly exposed. The outcast dog, the so-called "yellow cur," roams far and wide; he acts cowardly in the presence of danger, but it is only a surface cowardice based on bitter experience that has taught him to reserve his energies; when he is cornered, or when there is anything to gain, he fights and fights hard. I have no animosity toward this mongrel waif; he merits respect, and if he were not a menace to the public safety, I should regret to see him exterminated.

The ownership of animals imposes obligations, both relative to the animals and to the communities in which they are owned. This

statement is accorded the value of a truism when it is applied to an underfed or overworked or otherwise abused horse, or to a dangerous bull that is allowed to frequent a public common or highway unattended. But when we apply it to the dog it is quite another matter, and yet a rabid dog is more dangerous than a bull with a vicious disposition.

IMPORTANCE OF CAREFUL OBSERVATION OF DOGS.

But without the enactment of additional laws much can be done to reduce the danger from rabies. Every owner of a dog should examine it daily with sufficient care to detect marked changes in its physical condition and character that may be the symptoms of approaching disease, and when such changes are observed the dog should be so confined that, should it become affected with rabies, it will not be able to communicate the disease to persons and animals. This is very little to ask of dog owners. If they care for their dogs as they should, no special effort will be required to watch them carefully; and to properly isolate a dog when he is sick, or not quite normal, is a common-sense proceeding that should be universally practiced not only with dogs, but with all animals and persons that are sick, until it can be determined that they are not affected with a disease of the infectious or communicable kind. All diseases of dogs are not rabies, and rabies is not the only infectious disease of dogs. Proper confinement and isolation the moment dogs show a variation from their normal condition will reward itself in time, in addition to the effect it will have on the suppression of rabies, through a considerable reduction in the frequency with which diseases like mange, canine distemper, etc., occur.

Before a dog becomes affected with the active, furious form of rabies he commonly shows some preliminary symptoms. It is to be regretted that they are vague, indefinite, and uncertain. The dog may be morose and irritable or appear more affectionate than usual; he may be dull and stupid, or unusually nervous and excitable. Once the disease is fully developed there is nothing uncertain. The blind, desperate fury, followed by paralysis and death, are absolute diagnostic symtoms, but can not be observed by the owner unless the dog has been confined in time to keep him from running perhaps miles away from home.

Another precaution for dog owners to take is a careful examination of their dogs for injuries inflicted by other dogs when it is known that a dog in the neighborhood has become affected with rabies, or that a rabid dog has passed through the neighborhood. When injuries are found, the owner should either watch his dog with redoubled vigilance, muzzle him, and place him in confinement, or have him

destroyed in a painless manner. Since dogs are at all times apt to bite each other, frequently in play without viciousness, and rabies may be communicated by the bite of a rabid dog certainly as early as six days, and according to some authorities eight days, before the symptoms are apparent, this precaution for the safety of animals and persons is really an imperative obligation to the community imposed by the ownership of dogs.

DUTIES AND RESPONSIBILITIES OF DOG OWNERS.

Dog owners should bear in mind that, in urban if not in rural communities, they constitute a minority, and that even among themselves many, probably the majority, realize the great need of measures for the suppression of rabies. Unless precautions against the persistence and spread of rabies, such as have been suggested, are taken by dog owners, the enactment and enforcement of laws of the nature hereinbefore specified will become imperative. The reason why laws of this nature have not been made is due to the active fight against them by a small, greatly interested minority that opposes a tardy, disinterested majority. The minority fights hard for a privilege it has long enjoyed and abused, that of allowing dogs to be at large without restraint at all times, and the majority has never half realized that this privilege is costing a high price in the destruction of property and in horrible agony and numerous deaths. Many of our large cities are supporting institutes for the treatment of persons who have been bitten by rabid or mad dogs; other cities are contemplating the establishment of such institutes, and the need for such institutes is wholly the outgrowth of the difference between the liberty and privileges given dogs and those allowed to other domestic animals.

The real question is not one of affection for or animosity to the canine species. The dog, in his place, under proper observation and properly restricted, is an admirable, intelligent, companionable animal. This article has been written from the viewpoint of the dog owner. The writer has owned one or more dogs as long as he can remember, and now owns six of them. They are sheltered, well nourished, and contented, and are kept under conditions which insure that they shall not be an expense or a danger to the neighbors or to the community.

The dog owner who knows what rabies is from experience, if he has the proper consideration for his own welfare and that of his dogs, will be among the first to demand a movement for its suppression, even if this should place restrictions on the freedom of his dogs. His interest is greatest because he has the most at stake and is himself most seriously and frequently exposed to the infection.

O